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ABSTRACT

This guide was developed to encourage excellence in education, help educators meet standards, and integrate environmental education programs into school district curricula in Alaska. Educational activities are active, inquiry-based, interdisciplinary, and connected to real-world applications. The following evaluation criteria for standards-based environmental education materials and programs are included with evaluation worksheets: (1) usability; (2) instructional soundness; (3) depth and focus on concept.. (4) inquiry and skill building; (5) action-oriented project applications; and (6) fairness and accuracy of materials. This guide primarily concentrates on science standards. Important ecological concepts such as diversity and interdependence, and science skills such as inquiry are addressed in environmental education. These form the foundation needed to engage in environmental issue analysis and problem solving. (KHR)

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◆ FAIRNESS ◆ Forces and Motion ◆ DEPTH AND FOCUS ◆ Changes and Interactions of Matter ◆ USEABILITY ◆ Earth ◆ INSTRUCTIONAL SOUNDNESS

◆ INQUIRY AND SKILL BUILDING ◆ Diversity ◆ ACTION-ORIENTED PROJECTS ◆ Interdependence ◆ ASSESSING ◆ Skills of Scientific Inquiry ◆ ACCURACY

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Aligning Alaskan Environmental Education With Standards

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Developed by
Alaska Natural Resource and Outdoor Education Association (ANROE)

EC 473858

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ABOUT ANROE

The Alaska Natural Resource and Outdoor Education Association (ANROE) promotes and implements excellence in natural resource, outdoor, and environmental education for Alaskans. ANROE provides networking services, training, curricula development and review, and other support for people involved with natural resource education. A newsletter, Flyways, Pathways, and Waterways, is published three times a year.

Membership in ANROE is open to all educators at a cost of $30 per year.
Contact ANROE:
On the Internet at http://www.anroe.org/
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This guide was developed to further ANROE's goals of encouraging excellence in education, helping educators meet standards, and integrating environmental education programs into school district curricula.

Educational activities that help students to meet standards are active, inquiry-based, *interdisciplinary*, and connected to real-world applications. These types of activities are also the basis of environmental education. This guide cross-references accepted environmental education practices with the standards. Developers of environmental education programs and materials can identify how standards are being met, and improve existing materials or design new materials to meet the standards. Educators will be able to address curriculum standards by incorporating environmental education activities into their classrooms and programs.

This guide primarily concentrates on *science* standards. Important ecological concepts, such as diversity and interdependence, and science skills such as *inquiry* are addressed in environmental education. These form the foundation needed to engage in *environmental issue* analysis and *problem solving*. Other subject areas such as mathematics, reading, writing, and social studies also include skills and content critical to developing environmentally literate citizens. Educators are urged to seek out and meet standards that have been developed in those subject areas as well. Cultural diversity provides a rich context for learning in Alaska, and this guide addresses standards for culturally responsive schools as well as standards for science.

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Introduction

WHO?

This guide may be used by:

1) Classroom teachers, to select materials and activities and design an exemplary unit of study incorporating environmental education that meets standards, and
2) Developers of environmental education materials and non-formal programs, to revise existing materials and programs or create new materials and programs to meet standards.

This guide can help align units of study and instructional materials with the standards that have been developed to give our young people a high-quality, rigorous, and relevant education.

WHY?

The overall goals for this guide are:

- ➢ To develop an understanding of high-quality, standards-based, environmental education.
- ➢ To promote and guide the switch from "activity-based" instruction to lessons based on the attainment of important concepts and skills identified in state and national educational standards.
- ➢ To provide the means for environmental educators to demonstrate to parents, administrators, and educators how specific units of study and programs address the standards and/or the school and district curricula.

WHAT?

The following standards were used in the development of this document (see "Resources", page 30, for further information):

- ✓ Content Standards for Alaska Students, and Alaska Performance Standards for Science by the State of Alaska, Department of Education
- ✓ Alaska Teacher Standards by the State of Alaska, Department of Education
- ✓ National Science Education Standards by the National Research Council
- ✓ Benchmarks for Science Literacy by the American Association for the Advancement of Science
- ✓ Guidelines for Environmental Education by the North American Association for Environmental Education
- ✓ Alaska Standards for Culturally Responsive Schools

HOW TO USE THIS GUIDE?

This booklet includes:

1) Evaluation Criteria for developers of materials and programs to assess strengths and weaknesses and identify the work needed to improve attainment of the standards. Each section of the Criteria includes cross-references to the standards documents listed above. A reproducible worksheet accompanies the Criteria; it can also be used as a checklist for teachers to determine the components of exemplary standards-based units of study.
2) Correlation Charts to correlate topics and issues that are commonly included in environmental education units or programs with concepts from the Standards. A separate chart provides page number references to *developmentally appropriate* statements of those concepts in state and national standards documents.
3) An Appendices which includes a Glossary with definitions of words found in *italic* type throughout the text, and a Resource section so that the user can obtain the Standards and use them on a continuing basis.

Are the materials well designed and easy to use?

Environmental education materials should fully support an educator's needs.

Do the materials encourage sound instructional techniques?

Environmental education materials should be based on instructional techniques that create an effective learning environment.

Do the materials or activities use scientific inquiry and build life-long problem solving skills?

Environmental education materials should build life-long skills that enable learners to prevent and address environmental issues. These include skills associated with the scientific process of investigation, critical thinking, creativity, sharing, teaching, reporting, and taking action.

Is it Good? Does it Fit?

This guide can help answer the following questions about materials to consider using in a unit or program of study.

Do the materials foster a deep and clear understanding of ecological concepts?

Environmental education materials should foster a deep understanding of ecological concepts, by clearly identifying them and devoting sufficient time to develop understanding.

Do the materials guide students to actively identify, address and resolve real issues?

Environmental education materials should promote civic responsibility, encouraging learners to use their knowledge, personal skills, and assessments of environmental issues as a basis for environmental problem solving and action.

Are the materials fair and accurate?

Environmental education materials and programs should provide accurate information and fair representation of issues and problems including multiple points of view on controversial topics.

Why Do Standards-Based Education?

Standards-based education is an effective way to instruct for student understanding. The federal government, state government and many districts embrace standards in education because they work. Standards are based on the premise that if someone knows where they are heading they are more likely to get there. Statistically, when teachers, students and parents have a shared perception of what understandings and skills the student is expected to have, students more often reach those understandings and skills than if the shared perception of standards is lacking.

Environmental education consists of the types of activities identified as exemplary in the standards, such as those that are active, *inquiry*-based, *interdisciplinary*, and connected to real-world applications. This guide cross-references accepted environmental education practices with the standards. Developers of environmental education programs and materials can identify how standards are being met, and improve existing materials or design new materials to meet the standards. Teachers will be able to increase their involvement in environmental education in the context of meeting curriculum standards.

Standards and Curriculum

Curriculum includes what is taught, how it is taught, how it is assessed and the context within which it is taught. The standards that describe what is taught in terms of student understandings and skills are usually set by local school boards using the state standards as guidance. This is often now a public process. The instructional practices, *assessments* and context are professional decisions determined by the districts and teachers. This document addresses standards in all of these areas, providing guidelines for addressing student standards in a meaningful manner that taps deep understanding. Standards for instruction and assessment are addressed in the *instructional soundness* and *action-oriented* project sections. The context of learning is addressed by encouraging the use of local resources and experts and appropriate settings and *technology*.

What is Environmental Education?

The Belgrade Charter adopted by a United Nations conference provides a widely accepted goal statement for environmental education: To develop a world population that is aware of and concerned about the environment and its associated problems, and which has the knowledge, skills, attitudes, motivations, and commitment to work individually and collectively toward solutions of current problems and prevention of new ones.

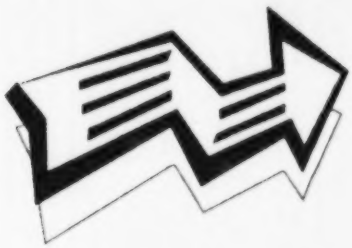
The North American Association for Environmental Education has adopted a goal of developing an environmentally literate citizenry. Components of environmental literacy include:

- ✓ Knowledge about natural systems and processes
- ✓ Basic science and math skills
- ✓ Understanding of human processes and systems
- ✓ Skills to investigate and analyze *environmental problems and issues*
- ✓ Ability to detect bias and distinguish *fact* from opinion
- ✓ Understanding the rights and responsibilities of citizens
- ✓ Citizen action skills

In Alaska, environmental education is often embedded within education about natural resources and their management and conservation, or included with outdoor education and survival skills. The diverse natural world of Alaska serves as a vast and relatively accessible outdoor laboratory. Many schools can incorporate first-hand contact and experience with the natural world through field trips led by teachers or provided through structured non-formal education programs.

How Can the Standards Be Met?

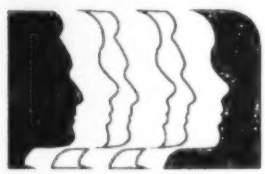
The hallmark of standards-based education is the focus on specific concepts and skills to be learned, rather than topics such as "bears" or "rocks." Ideally, an educator will (in this order):



- Choose a concept or skill to teach.
- Develop a clear idea of what a student will be able to do or demonstrate after they have learned it.
- Choose and develop activities that will help the student to get there.
- Assess whether the student has gained the specific concept or skill intended.

An education process is underway to acquaint teachers with concepts and skills that are important and *developmentally appropriate*. In Alaska, national and state standards are being incorporated into school district curricula and with teacher training, into the design of units of study to meet the district standards. The worksheet in this document lists the components of an exemplary environmental education program as part of that education process.

Many curricular materials and field trip opportunities currently available to Alaska schools do not incorporate this standards-based approach. A process of revision is underway to meet the standards. The evaluation criteria matrix in this document can help developers of programs and materials to assess strengths and weaknesses in relation to an exemplary unit of study and give guidance to revise and upgrade their program to meet various components of the standards.



Standards-based instruction recommends high expectations for learning by all students, not standardization. It acknowledges that different regions of the state, and different cultures, communities, schools, classrooms and students may all take different pathways to get to the fundamental understandings and skills described in the student standards. There is no lesson or unit that fits all schools or students. There are research-proven best practices in instruction and *assessment* that are reflected in this document. The guidelines in this document can lead to a rich diversity of units.

This guide is **not** meant to be a stand-alone "guide to the standards." To align a program of instruction with standards, there is no substitute for reading the standards and becoming familiar with them.

Evaluation Criteria for Standards-Based Environmental Education Materials and Programs

- **Are the materials well designed and easy to use?**
- **Do the materials encourage sound instructional techniques?**
- **Do the materials foster a deep and clear understanding of ecological concepts?**
- **Do the materials or activities use scientific inquiry and build life-long problem-solving skills?**
- **Do the materials guide students to actively identify, address, and resolve real issues?**
- **Are the materials fair and accurate?**

How to Use the "Evaluation Criteria"

The evaluation criteria are intended to provide a picture of the strengths and weaknesses of particular materials or programs, to find out where the gaps are in terms of meeting goals and aligning with standards, and to show what an excellent program might "look like." Program and materials developers can use the criteria to develop a blueprint to meet all of the standards or selected components of the standards. It is not intended to to be used as an endorsement or a comparison to other programs.

There are six different categories of evaluation criteria which are intended to incorporate all of the important qualities of excellent programs and all of the *science* and environmental education standards. Because the evaluation guide is lengthy, there may be a temptation to use only one, or only a few, of the six categories of criteria, and to evaluate materials or a program on just one aspect at a time. However, the evaluation guide is **only valid as a whole**. As an example, if materials or a program are evaluated on "*Instructional Soundness*," and only that page of the evaluation guide is used, some important aspects of "soundness" such as a focus on concepts, relevance to students' lives, and factual *accuracy* of materials will be missed. And, if only the "*Depth* and *Focus* on Concepts" page is used, it would be possible to view materials or a program as being very strong in that area, and miss the fact that the concepts chosen might be totally inappropriate for the age level of the students.

The Criteria are not intended to be used with a single activity, since it is unlikely that one activity will rate high in all areas. Activities, programs and resources should be chosen and sequenced to complement each other so that ultimately all the criteria for excellence will be met during the course of the unit of study or during the course of the year. Within each of the six sections, some individual criteria may not be applicable to particular material being evaluated. Users of the Criteria can be judicious in their choice of sections to use for a single unit of study and for sequencing. For example, student-centered lessons can reasonably be preceded by teacher-guided instruction. Some units will have an action step, others will not.

Each criterion **is** intended for use at all grade levels, in a *developmentally appropriate* manner. For example, the guidelines say that "exemplary materials help students to practice and apply skills for evaluating information presented." This may seem too sophisticated for very young students, but even the youngest students can learn skills that will provide the foundation for doing this as they get older. They can learn the difference between true and false, ask and answer questions about "how we know" what we know, and begin to understand what constitutes "evidence." They can compare their experiences and observations with those of others.

Following the Criteria is a four-page worksheet/checklist that can be reproduced. It can be used by developers to assess and keep track of strengths and weakness for specific materials. It can also be used by teachers who are selecting materials, participating in non-formal education programs, and sequencing activities during the design of a unit of study.

Part I: Are the materials well designed and easy to use?

	EXEMPLARY	STRONG	HAS POTENTIAL	NEEDS IMPROVEMENT
Engaging	• The activity format or subject matter is unique and presented in an innovative way. • Learning activities are extremely exciting and interesting to students and teachers.	• Format or subject matter is unique or presented in an innovative way. • Learning activities generate student and teacher interest.	• Format or subject matter contains a few fresh ideas. • Additional effort is needed to make learning activities interesting to students and teachers.	• Nothing about this activity generates excitement or interest in students or teachers.
Practical	• Materials, supplies and site are readily available with reasonable cost and effort. • Preparation time is reasonable.	• Materials and supplies are available with reasonable cost and effort. • Extra preparation time is needed.	• Materials and supplies are available with some effort. • Extensive preparation time is required.	• Materials and supplies are expensive and/or unavailable. • Preparation time required is too extensive to fit an instructor's schedule.
Adaptable	• Universally useable or readily *adaptable*.[1] Suggestions given for adaptations for diverse student populations.[2] Activity extensions suggested.	• Universally useable or readily adaptable. No suggestions for extensions or adaptations to diverse audiences.	• Some adaptation must be made before the materials can be used.	• Teacher must make too many changes to get the activities to fit into the instruction.
Background and References	• Background information fully prepares the teacher to teach the unit. • References for additional resources are provided.	• Background information is provided, but does not fully prepare the teacher. • Some additional references are provided.	• Background information is provided, but is difficult to locate or understand, inaccurate, or incomplete. • References are incomplete or difficult to access.	• No background information provided. • No references.
Support for Teacher	• Instructions[3] for teacher and student materials are very clear, complete, and easy to use. • Needed technical support[4] is included.	• Instructions for teachers are complete, but format makes them more difficult to find. • Technical support is included.	• Instructions somewhat unclear; some interpretation is necessary. • Limited technical support is included.	• Instructions unclear or incomplete. • Technical support is not included.
Integration of Standards	• The materials or activities readily integrate into established curriculum. • Clearly identifies the standards or curriculum requirements addressed.	• Some effort or interpretation of materials needed to fit curriculum and justify use. • Standards or curriculum requirements addressed but not identified.	• Major effort or interpretation of materials needed to fit curriculum. • Standards or curriculum requirements poorly addressed.	• No integration with curriculum. Use of materials difficult to justify. • No standards or curriculum requirements are addressed.

Notes and Examples:

[1] Adaptable: The activity can be easily modified to fit different environments, settings, group size, and cultural backgrounds.

[2] Diverse student populations: Materials should provide suggestions for students with special learning needs, language needs, and physical needs.

[3] Instructions: The activity should clearly provide the following information: intended audience/age level, setting, group size, concepts covered, learner outcomes, skills addressed, equipment needed, and time needed. The following activity categories are desirable: activity overview, background information, instructions, *assessment*, and pre and post activities.

[4] Technical support: If needed, a toll free number or contact for questions about materials is included. Agency contacts, access to a network of other educators, essential support materials and databases are included.

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Useability

- **Are the materials well designed and easy to use?**
- Do the materials encourage sound instructional techniques?
- Do the materials foster a deep and clear understanding of ecological concepts?
- Do the materials or activities use scientific inquiry and build life-long problem-solving skills?
- Do the materials guide students to actively identify, address, and resolve real issues?
- Are the materials fair and accurate?

Environmental education materials should fully support an educator's needs.

Standards Reference for Criteria

These are provided to help demonstrate alignment with the standards. Please use our Resource Section (p.30) to obtain copies of the standards that are relevant.

Standards Reference	State of Alaska Teacher	National Science Education	North American Association for Environmental Education
Criteria Refers to:	numbered standard	page number	numbered standard
Engaging	2, 3, 6	212	5.3, 6.1, 6.2
Practical		218	6.4, 6.2, 6.5
Adaptable	3, 6, 7	30	5.3, 6.4
Background and References	4		1.4, 3.2, 5.4, 6.1, 6.5
Support for Teacher	4, 5, 6	218	6.1, 6.2, 6.5
Integration of Standards	2, 3, 4, 5, 6, 7		5.5, 6.7

AAAS: American Association for the Advancement of Science (Benchmarks for Science Literacy)
NAAEE: North American Association for Environmental Education

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Part II: Do the materials encourage sound instructional techniques?

	EXEMPLARY	STRONG	HAS POTENTIAL	NEEDS IMPROVEMENT
Learning Styles	• Instruction is based on a variety of identified *learning styles* to address *multiple intelligences*.[1]	• Instruction addresses multiple learning styles, but these are not identified.	• Acknowledges some diversity in students, or uses diversity in instructional approach.	• Acknowledges only one learning style. Single instructional approach.
Developmentally Appropriate	• Specific grade or *developmental levels* (an age range rather than K-12) targeted. • Selected concepts and skills are at an appropriate level for students' cognitive development.[2] • Activities are suitable and safe for physical and emotional capabilities of students (i.e., young students aren't handling hazardous materials).	• Specific grade or developmental levels targeted. • Activities are well-matched to students' cognitive abilities. • Activities are a good match for students' physical and emotional capabilities.	• Activity targets too broad a range of grade levels. • Concepts and skills are not an appropriate level. • There are some safety or emotional concerns.	• No grade level is specified. • Activities are potentially dangerous.
Cross-Curricular	• Content integrates and clearly lists multiple subject disciplines. Builds concepts in multiple disciplines. • Referenced to both content and teacher standards from the multiple disciplines.	• Multiple disciplines included. • Referenced to content OR teacher standards for several disciplines.	• One discipline identified: tie-in to other disciplines is suggested. • Standards referenced for one discipline only.	• Addresses only one discipline; tie-ins to other disciplines absent.
Learner Centered	• Responsibility for learning is shared. Teacher acts as a facilitator and creates a classroom community of cooperation and respect. • When appropriate, students' interests and concerns are the starting point of instruction. • Activities allow learners to undertake own inquiry; building on past knowledge, experience and culture.	• Some evidence of shared responsibility for learning with teacher as facilitator. • Students' interests, concerns, and prior knowledge are addressed, but are not the basis of the lesson.	• Teacher maintains responsibility and authority for learning and/or encourages competition. • Students' interests and prior knowledge are identified, but don't influence instruction.	• Teaching strategies unclear or not described. • Students' interests, concerns, and prior knowledge are not addressed.
Use of Resources/ Community	• Full and appropriate use of human resources[3] to address central concepts of the unit. • Taught in most appropriate settings.[4] • Innovative and appropriate uses of materials and instructional technologies.[5]	• Human resources used to address concepts, but some key resources are omitted. • Does not make full use of available settings. • Generally appropriate use of materials and instructional technologies.	• Human resources used are superficial to main lesson (used as an afterthought). • Setting considered but not made a priority. • Doubtful use of materials/technologies.	• No outside human resources are used. • Setting not taken into consideration. • Inappropriate use of materials and technology.
Assessment	• Students assessed throughout unit as a guide to instructional choices. *Assessments* tap deeper scientific and cultural understanding, reasoning and skill development. Students are asked to apply knowledge and skills to new situations, for all concepts and skills addressed. Multiple assessment techniques[6] are used to address all learner styles. Assessments are tied to real world. • Expectations are made clear to students at onset, based on goals, outcomes, or understandings. Students assess their own strengths and weaknesses and adapt to improve learning.	• Some attempt is made to assess what students know and are able to do, but assessment is incomplete. Multiple assessments are included but only some are tied to real world. • Expectations are added as unit progresses. Students do self-assessment, but no adaptation of instruction is done to address strengths or weaknesses.	• Students are tested at end of unit on easily measured factual knowledge. Deeper understanding or skill development is not fully assessed. • Expectations are not made clear or aligned with assessment. Superficial student self-assessment is focused on weaknesses.	• No assessments done either during or at the end of a unit. • Expectations are not identified.

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Instructional Soundness

- Are the materials well designed and easy to use?
- **Do the materials encourage sound instructional techniques?**
- Do the materials foster a deep and clear understanding of ecological concepts?
- Do the materials or activities use scientific inquiry and build life-long problem-solving skills?
- Do the materials guide students to actively identify, address, and resolve real issues?
- Are the materials fair and accurate?

Environmental education materials should be based on instructional techniques that create an effective learning environment.

Standards Reference for Criteria

These are provided to help demonstrate alignment with the standards. Please use our Resource Section (p.30) to obtain copies of the standards that are relevant.

Standards Reference	State of Alaska Teacher	AAAS Bench-marks	National Science Education	Alaska Standards for Culturally Responsive Schools	NAAEE
Criteria Refers to:	numbered standard	chapter and section	page number	numbered standard (Ed=Educator, Cu=Curriculum, S=School)	numbered standard
Learning Styles	2, 3, 4, 5				5.2
Developmentally Appropriate	2, 3, 5, 6	4, 5	30, 212		5.2,5.7
Cross-Curricular	4, 5		30, 214		5.5
Learner Centered	2, 3, 4, 5, 6	6D	31	**Ed:** B-all, D3, E1-3	1.3,3.2,3.3,4.1,4.2,5.1
Use of Resources/Community	7		45	**Ed:** A2-4, B1-2, D1-2; **S:** A1-2, B2, E2-3, F-all; **Cu:** C4-5	4.2,5.3,5.4
Assessment	5		21, 84, 86	**S:** B4; **Cu:** A1-2, C5, D2	5.1,5.8

AAAS: American Association for the Advancement of Science (Benchmarks for Science Literacy)
NAAEE: North American Association for Environmental Education

Notes and Examples:

[1] Multiple intelligences include: auditory, tactile, naturalistic, kinesthetic, logical, and mathematical. Strategies may include: experimenting, role-playing, researching, creative writing, and/or cooperative groups.

[2] Developmental levels: For example, primary students understand that animals eat plants and other animals, intermediate students understand that all food can be traced back to plants, middle school students understand the flow of energy from organism to organism in food webs and high school students understand ecological systems. See Benchmarks, NSES, or Alaska State performance standards for specifics on all important science concepts (page 30). The balance of concrete and abstract activities is appropriate to the students' level.

[3] Human resources might include: scientists, Elders, parents, businesses, and/or government agencies.

[4] Appropriate settings might be natural settings, nature and science centers, fish camps, outdoors, schoolyards, labs, universities, or museums.

[5] Instructional technologies may include: computers, digital cameras, video microscopes, calculators, telephones, measuring devices, and GIS software. These should be used in a way that enhances instruction and builds students' skills.

[6] Multiple assessment techniques may include: portfolios, performance assessments, demonstrations, student self-assessment, journals, tests, scoring guides, and/or feedback loops involving students, teachers, and communities.

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Part III: Do the materials foster a deep and clear understanding of ecological concepts?

	EXEMPLARY	STRONG	HAS POTENTIAL	NEEDS IMPROVEMENT
Concepts Are Identified	• The concepts, knowledge, and/or skills are clearly and accurately identified and stated in a manner that facilitates assessment.[1] • Activities and *assessments* relate directly to the stated concepts and skills. Includes a framework to show how the concepts relate to each other.	• Concepts, knowledge, and/or skills to be taught are stated and well-matched to lessons and assessments.	• Concepts, knowledge, and/or skills are identified but are not well-matched to the activities and assessments.	• *Objectives* are unclear. "Topic" may be identified but it is hard to determine the concepts, knowledge, and skills being taught.
Concepts are Important	• Concepts are identified in District, State, and/or National standards. *Focus* is on big ideas[2] rather than *facts* and vocabulary. Emphasizes interactive systems rather than independent components.	• Concepts generally match standards and reflect important ideas related to students' lives.	• Relationship to standards is unclear. There is a concentration on isolated facts or "trivial" knowledge.	• Has little or no relationship to standards or to students' lives.
Builds Thorough Understanding of Concepts	• Students demonstrate their understanding by applying concepts and skills to new situations.[3] • Activities are structured to present concepts and skills sequentially and connect ideas.[4]	• Students demonstrate their understanding by comparing, contrasting, and analyzing. • Ideas are connected in a logical manner.	• Learning is mostly at a "rote memorization" level. • Concepts are presented in a random or isolated manner.	• Understanding of concepts is absent.
Multiple Dimensions of Concepts are Important	• Most of the four Alaska Science Standards are addressed:[5] A) Concepts and Science Knowledge B) Inquiry and process skills C) Nature and History of *Science* D) Applications	• More than one dimension effectively addressed.	• Attempts to address the concept from more than one dimension, but is ineffective. Relationships and connections are unclear.	• There is no attempt to address more than one dimension.
Appropriate Allocation of Time	• Student time is used efficiently in relation to the potential for gaining deep understanding. Opportunities are provided for further exploration and questioning.	• Students' time is generally used to learn important concepts and skills, but efficiency could be improved. Opportunities for extension are limited.	• Students spend a disproportionate amount of time on unimportant activities. No opportunities for further exploration are given.	• Most of students' time is spent on activities irrelevant to learning the concepts (e.g., coloring, riding on bus).

Notes and Examples:

[1] Concepts should be stated in a way that is specific and appropriate for the age level. For example, a broad concept is "diversity of life," but a specific concept to be taught to first graders might be: " Plants and animals have features that help them live in different environments." (from AAAS Benchmarks, p.102) In addition, a statement of "how you will know" whether or not students understand the concept can be given. See footnote #3.

[2] Big ideas might include such things as "interdependence," "diversity," or "change."

[3] For example, students could apply their knowledge about animal features by designing an imaginary animal for a specific environment, or finding examples of animal adaptations in the real world.

[4] For example, to be ready to understand plant succession, it is necessary to understand that plants have features that help them live in different environments, and that environments are constantly changing.

[5] An exemplary lesson on succession, for example, would a) help students to acquire knowledge about succession, b) give them practice in designing investigations to study succession, c) allow them to look at how our knowledge of successional processes is being formed, and d) give them an opportunity to apply their learning to monitor or manage areas near their home.

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Depth and Focus on Concepts

- Are the materials well designed and easy to use?
- Do the materials encourage sound instructional techniques?
- **Do the materials foster a deep and clear understanding of ecological concepts?**
- Do the materials or activities use scientific inquiry and build life-long problem-solving skills?
- Do the materials guide students to actively identify, address, and resolve real issues?

Environmental education materials should foster a deep understanding of ecological concepts, by clearly identifying them and devoting sufficient time to develop understanding.

Standards Reference for Criteria

These are provided to help demonstrate alignment with the standards. Please use our Resource Section (p.30) to obtain copies of the standards that are relevant.

Standards Reference	State of Alaska Teacher	AAAS Bench-marks	National Science Education	Alaska Standards for Cultur-ally Responsive Schools	State of Alaska Student Content	NAAEE
Criteria Refers to:	numbered standard	page number	page number	numbered standard(Ed=Educator, Cu=Curriculum, S=School)	section & key element number	numbered standard
Concepts are Identified	2, 4		210	Cu: C5		2.2,5.5,5.6,5.8,6.1
Concepts are Important	2, 4	317	30	S: B1; Cu: C2-5, E 1-3		2.2,2.3,5.5,5.6
Builds Thorough Under-standing of Concepts	4, 5, 6	314 327-361	33, 36	Ed: B3-5, E2; Cu: A3,C2,E1-3		2.2,2.3,5.1
Multiple Dimensions of Concepts are Addressed	2,3,4,5,6	315	212		A,B,C,D	3.1,3.3,5.1
Appropriate Allocation of Time	6		43, 218			5.7

AAAS: American Association for the Advancement of Science (Benchmarks for Science Literacy)
NAAEE: North American Association for Environmental Education

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Part IV: Do the materials or activities use scientific inquiry and build life-long problem-solving skills?

	EXEMPLARY	STRONG	HAS POTENTIAL	NEEDS IMPROVEMENT
Scientific Processes	• Investigations incorporate *developmentally appropriate* scientific processes[1] in a purposeful way that leads to scientific validity.	• *Processes of science* are not identified, yet are used in a purposeful way leading toward scientific validity.	• Limited use of the processes of science.	• No uses of the processes of science.
Questioning	• Teacher facilitates process by which students generate appropriate, relevant questions to investigate.[2]	• Students make choices among possible questions to investigate.	• Materials or teacher provides question for investigation.	• No opportunity for investigation is given.
Investigating	• Materials allow students to design an investigation to answer questions.[3] • Time allowed for investigation is adequate to answer the question.	• Guidance is provided, and students are allowed some latitude in designing an investigation. • Time for investigation is adequate.	•Investigation(s) steps are spelled out in a cookbook manner. • Time is contrived to fit instruction rather than needs of investigation.	• No investigations are included.
Evaluating	• Students practice and apply skills[4] for evaluating information presented. Students identify how values and attitudes play a role in the evaluation of information.	• Students explore ways of evaluating information.	• Students explore one way of evaluating information.	• No evaluation of information is done.
Communicating	• Provides opportunities for students to practice communication with peers in class. Also provides direct instruction and guidelines for effective communication with a wide range of audiences via various written, oral and/or visual media.	• Provides direct instruction in communication skills, along with clear criteria for quality communication.	• Includes instruction on communication skills, but does not assist students in developing these skills.	• Communication opportunities are not included.
Environmental Issues and Problem Solving	• Provides opportunities to demonstrate skills in a)identifying and analyzing issues and problems, b)proposing solutions, and c)evaluating possible solutions. Includes multiple methods.[5]	• Provides direct instruction in the skills needed for analyzing and resolving issues and/or solving problems, but no opportunity to apply or demonstrate skills.	• Includes issues and/or problems, but does not provide opportunities to develop problem-solving skills.	• No issues or problems identified.
Safety and Environmental Impacts	• Promotes all possible safety concerns and procedures (including use of equipment) related to personal safety and environmental impacts.[6]	• Promotes either personal safety OR environmental impacts, in a comprehensive manner.	• Suggests some safety or environmental impact concerns.	• Safety and environmental impacts are not mentioned.

Notes and Examples:

[1] Scientific Processes include: observation, communication, comparison, organization, relation, inferring, and application.

[2] For example, students might question why musk ox or bears are coming into their communities.

[3] For example, students could develop their own hypothesis about why bears come into their community, and then develop and carry out a procedure to test that hypothesis. Students decide what type of data they should collect and what variables should be controlled. The teacher might provide guidance by asking them questions about their investigation's design to help improve validity or safety. In evaluating the potential of material or an activity to help students develop investigation skills, consider the subject matter and types of questions raised in order to decide what is an appropriate balance of teacher guidance and student independence.

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Inquiry and Skill Building

- Are the materials well designed and easy to use?
- Do the materials encourage sound instructional techniques?
- Do the materials foster a deep and clear understanding of ecological concepts?
- **Do the materials or activities use scientific inquiry and build life-long problem-solving skills?**
- Do the materials guide students to actively identify, address, and resolve real issues?
- Are the materials fair and accurate?

Environmental education materials should build life-long skills that enable learners to prevent and address *environmental issues*. These should include skills associated with the scientific process of investigation, *critical thinking*, creativity, sharing, teaching, reporting, and taking action.

Standards Reference for Criteria

These are provided to help demonstrate alignment with the standards. Please use our Resource Section (p.30) to obtain copies of the standards that are relevant.

Standards Reference / Criteria Refers to:	State of Alaska Teacher numbered standard	AAAS Benchmarks chapter and section	National Science Education page number	Alaska Standards for Culturally Responsive Schools numbered standard(Ed=Educator, Cu=Curriculum, S=School)	State of Alaska Student Content section & key element number	NAAEE numbered standard
Scientific Processes	2,4,6	1B,3A,12A,12C	113		B-1, B-5	3.1,3.3
Questioning	2,4,6	1B	121,143,175	Cu: B1,C4; Ed: B1	B-2,3,4	3.1,3.2,5.1
Investigating	2,4,6	1B	113	Cu: E1-E3; S: B2	B-2,3,4,5	3.1,3.2,3.3,5.1
Evaluating	2,4,6		121,143,175	Cu: C2		1.3,2.1,3.1,3.2,3.3
Communicating	2,3,5,6,7	1B,1C,12D	121,143,175	Cu: C6; S: A2, E2-E3,F3	B-1, C-5	3.1,3.3,4.2,5.2,5.4
Environmental Issues and Problem Solving	2,4,5,6,7	3B,3C,7D, 7E,7F,12E	198	Cu: E1-E3; Ed: A4	D-1,2,3,4,5,6	3.1,3.2,3.3,5.1
Safety and Environmental Impacts	6,7	12C	44		B-6	4.1,5.7

AAAS: American Association for the Advancement of Science (Benchmarks for Science Literacy)
NAAEE: North American Association for Environmental Education

Notes and Examples continued:

[4] Skills include: distinguishing opinion from *fact*, recognizing reliable sources, and understanding how values can effect the information presented.

[5] Examples might include a) using media such as the newspaper, Internet, TV, or movies to identify value-related terms that are used to convey the interest of the writer; b) doing a value clarification activity with an issue such as litter, air quality, or water quality; c) determining how the convenience of plastic shopping bags affects the amount of litter that their community produces and the possible effects on local bird and fish populations.

[6] Potential environmental impacts to be aware of during field trips/investigations might include: damage to muskeg or other highly sensitive areas, overcollecting of plants or artifacts or disturbance of stream beds.

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Part V: Do the materials guide students to actively identify, address, and resolve real issues?

	EXEMPLARY	STRONG	HAS POTENTIAL	NEEDS IMPROVEMENT
Solving Real Community Problems	• Materials encourage students to fully explore a community issue, evaluate their role in the issue, and develop and implement a plan of action to address it. Students are encouraged to incorporate local knowledge and concerns,[1] conduct environmental investigations, analyze issues and develop skills for decision-making and citizen action.	• Materials encourage students to explore community issues, but their action plans don't address all aspects of the issue.	• Materials encourage students to explore a community issue, but don't identify a student's role in it. No action plan is implemented.	• No community action component.
Sense of Power: "I Can Make a Difference"	•Materials encourage students to perceive their ability to make a difference. Safe and appropriate strategies for citizen action are taught. Students select school or community projects to implement.[2] (Projects match students' abilities and have a high chance of success.)	• Materials encourage students to explore community involvement strategies through case studies and simulations. Students plan, but don't implement school or community projects.	• Materials encourage students to plan or implement community action projects, but students are not adequately prepared to do so successfully.	• No strategies for citizen action are offered, or students focus on an issue that will not allow them to actually affect change.
Sense of Place	• Materials promote a *sense of place*, through a sense of belonging, a sense of ownership and mutual respect for all members of the community.[3] Activities promote a mutually beneficial partnership of community members and increase parental involvement in schools.	• Materials encourage a sense of place, but omit some aspects. Community and/or parent partnerships are developed.	• Some attempt to promote a sense of belonging, ownership, or mutual respect. Minimal use of community partnerships.	• Materials do not foster a sense of place. Community partnerships are not developed, or are developed in a negative way.
Informed Action	• Materials encourage students to base actions on a complete understanding of the issue.	• Materials encourage students to base action on a partial understanding of the issue.	• Materials encourage students to base actions on only one aspect of the issue.	• Materials allow students to base actions on emotion or false information.
Responsibility	• Students see the social, cultural, and ecological consequences of their values and actions and modify their behavior accordingly.[4]	• Students reflect on their behavior and examine choices. They recognize their role but don't take action.	• Students examine consequences of human actions, but don't recognize that they have a personal role.	• No reflection on behavior or consequences of decisions.
Science, Technology and Society	• Materials use extensive exploration of relationships betweeen *science*, *technology*, environment, and *society*. Students are required to consider *ethics* and/or quality of life issues.	• Some exploration of the relationships between science, technology, environment, and society. Students are encouraged to consider ethics and/or quality of life issues.	• Mentions briefly the relationships between science, technology, environment, and society. Ethics and/or quality of life issues are discussed only briefly.	• Does not acknowledge any relationships between science, technology, and society. No discussion of ethics or quality of life issues.

Notes and Examples:

[1] Students might interview Elders, community experts, or neighbors about their experiences or their concerns. *Traditional knowledge* and practices can be explored. Students can conduct their own first-hand scientific investigations by collecting local data.

[2] Examples of community projects: a) urban school students could implement a recycling project, b) rural school students could work towards banning styrofoam from their school or work towards replacing plastic grocery bags with reusable cloth bags.

[3] The community includes humans and all other life forms. Materials help students see their connection to the natural world.

[4] Materials convey the idea that many individual actions have cumulative effects, both in creating and addressing *environmental issues*. They promote intergenerational and global responsibility, linking actions with consequences.

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Action-Oriented Project Applications

- Are the materials well designed and easy to use?
- Do the materials encourage sound instructional techniques?
- Do the materials foster a deep and clear understanding of ecological concepts?
- Do the materials or activities use scientific inquiry and build life-long problem-solving skills?
- **Do the materials guide students to actively identify, address, and resolve real issues?**
- Are the materials fair and accurate?

Environmental education should promote civic responsiblity, encouraging learners to use their knowledge, personal skills, and assessments of *environmental issues* as a basis for environmental problem solving and action.

Standards Reference for Criteria

These are provided to help demonstrate alignment with the standards. Please use our Resource Section (p.30) to obtain copies of the standards that are relevant.

Standards Reference	State of Alaska Teacher	AAAS Bench-marks	National Science Education	Alaska Standards for Culturally Responsive Schools	State of Alaska Student Content	NAAEE
Criteria Refers to:	numbered standard	chapter and section	page number	numbered standard(Ed=Educator, Cu=Curriculum, S=School)	section & key element number	numbered standard
Solving Real Community Problems	3,6,7		45, 220-221	Cu: E3	D 1-6	3.2, 3.3, 4.2
Sense of Power: "I Can Make A Difference"	3,6,7			Cu: E3; S: F1	D 3-6	3.3, 4.2
Sense of Place	3,6,7			Ed: A1-4,A6, all of B,C,D, E1-2		2.1, 5.3, 5.4
Informed Action	4,7					3.1,3.2,3.3
Responsibility	6,7		46	Cu: B2, C2, E1-3	D 3-6	4.1
Science, Technology and Society	3,6,7	1C, 3A, 3C, 7D	138, 166, 193		D-2, D-4	2.3, 3.2

AAAS: American Association for the Advancement of Science (Benchmarks for Science Literacy)
NAAEE: North American Association for Environmental Education

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Part VI: Are the materials fair and accurate?

	EXEMPLARY	STRONG	HAS POTENTIAL	NEEDS IMPROVEMENT
Balanced Viewpoints	• Differing viewpoints[1] are explored fully.	• Differing viewpoints are presented but not explored fully.	• Differing viewpoints are mentioned, but one is treated as more valid.	• Only one viewpoint is acknowledged.
Factual Accuracy	• Materials are based on sound theory, *Facts* are clearly referenced to current, identified, well-documented *primary sources*.	• Materials are based on sound theory. Sources are referenced, but may not be current or well-documented.	• Materials appear to be factual and based on sound theory, but sources are not identified.	• Theory and facts presented are questionable.
Separating Facts from Opinion	• Students build skills in recognizing possible biases. Values are separated from *facts*. Language is balanced and non-inflammatory. Opinions are clearly stated as such. Organizational affiliations of authors are clearly identified.	• Values are separated from facts. Language is balanced and non-inflammatory. Opinions are stated as such. Affiliation of authors is stated.	• Opinions, values and facts are difficult to discern. Language may be emotionally charged or misleading. Affiliations of authors are unclear.	• Language used in the activity is inflammatory. No organizational affiliation is stated. Opinions, values and facts can't be separated.
Awareness of Values	• Materials help students to respect, understand, and empathize with opinions and values different from their own. Examines the varied methods cultures use to validate knowledge. [2]	• Encourages consideration of opinions and values of others. Discusses more than one culture's method of validating knowledge.	• Mentions respect for different opinions and values. Acknowledges that different cultures may validate knowledge in different ways.	• The idea of respect for values and opinions of others is absent. Covers only one culture's method of validation.

Notes and Examples:

[1] Differing viewpoints on mining issues, for example, would include research and points of view of a) government mining agencies such as the Bureau of Mines, b) government environmental agencies such as Fish and Game, and c) private organizations including mining company trade organizations and environmental advocacy groups. Lessons on subsistence could include presentations by Alaska Federation of Natives members and Alaska Outdoor Council members.

[2] Validating knowledge might involve field experiments; data collection; and consultation with Native Elders, professional scientists, and individuals with personal experience.

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Fairness and Accuracy of Materials

- Are the materials well designed and easy to use?
- Do the materials encourage sound instructional techniques?
- Do the materials foster a deep and clear understanding of ecological concepts?
- Do the materials or activities use scientific inquiry and build life-long problem-solving skills?
- Do the materials guide students to actively identify, address, and resolve real issues?
- **Are the materials fair and accurate?**

Environmental education material and programs should provide accurate information and fair representation of issues and problems including multiple points of view on controversial topics.

Standards Reference for Criteria

These are provided to help demonstrate alignment with the standards. Please use our Resource Section (p. 30) to obtain copies of the standards that are relevant.

Standards Reference	State of Alaska Teacher	AAAS Bench-marks	National Science Education	Alaska Standards for Culturally Responsive Schools	State of Alaska Student Content	NAAEE
Criteria Refers to:	numbered standard	chapter and section	page number	numbered standard(Ed=Educator, Cu=Curriculum, S=School)	section & key element number	numbered standard
Balanced Viewpoints	3,4,7	1A, 1C, 12A		Ed: D1-4,E1,E2,E4,E5,F1 Cu: A1,A3,A4,C2,C4,D1	C-3,C-4	1.2,1.3,2.3,3.2
Factual Accuracy	4	12A		Ed: A1	C-1, C-2	1.1
Separating Facts from Opinion	3,4,7	1B			C-4, C-8	1.1, 3.1
Awareness of Values	3,7	7F, 12A	200	Cu: A1-4,C2,E; S: A3; Ed: A1,E1,E4,E5	C-3, C4, C-8	1.3, 1.4, 2.3

AAAS: American Association for the Advancement of Science (Benchmarks for Science Literacy)
NAAEE: North American Association for Environmental Education

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EVALUATION WORKSHEET

This worksheet follows the Criteria item-by-item, and is intended to be reproduced and used to accompany the charts on pages 8 through 19 as an evaluator works through them. Experienced users of the Criteria may be able to use the worksheet on its own, with only occasional references back to the guide.

1. Are the materials well designed and easy to use?	(See Part I: pp. 8-9)
Engaging: Are the materials unique and presented in an innovative, exciting, or interesting manner?	
Practical: Are practical materials readily available at reasonable cost and effort? Is the preparation time reasonable?	
Adaptable: Are the materials adaptable and universally useable for diverse populations?	
Background & References: Does the background information and do resource references prepare the teacher to teach the unit?	
Support for Teacher: Are instructions and technical support clear, complete, and easy to use?	
Integration of Standards: Are standards identified and addressed in a way that allows the content to be integrated into the established curriculum?	

What are the strengths of the materials related to **Useability**?

What could you do to improve the materials?

Source: Targeting Excellence: Aligning Alaskan Environmental Education With Standards **(ANROE 2000)**

II. Do the materials encourage sound instructional use?

(See Part II: pp. 10-11)

Learning Styles: Is instruction based on a variety of identified learning styles and intelligences?	
Developmentally Appropriate: Are the activities suitable and safe for the developmental levels of the students?	
Cross-Curricular: Are the materials structured to integrate content and student standards into multiple disciplines?	
Learner Centered: Does the teacher facilitate cooperation and encourage student inquiry based on student knowledge, experience and culture?	
Use of Resources/Community: Do materials encourage use of appropriate human resources and innovative technologies to address lesson concepts?	
Assessment: Are assessments multiple, based on clear goals, and used throughout the unit allowing students to apply skills to new situations?	

What are the strengths of the materials related to **Instructional Soundness**?

What could you do to improve the materials?

III. Do the materials foster a deep and clear understanding of ecological concepts?

(See Part III: pp.12-13)

Concepts Are Identified: Are concepts clear, accurate, and related to activities?	
Concepts Are Important: Are concepts identified in district, state and national standards?	
Builds Thorough Understanding of Concepts: Are students encouraged to look at the big picture rather than individual facts?	
Are activities sequentially structured to allow students to apply concepts and skills?	
Multiple Dimensions of Concepts Are Addressed: Are all four of the Alaska Science Content Standards addressed?	
Appropriate Allocation of Time: Is student time used efficiently for understanding concepts and are opportunities provided for questioning and exploration?	

What are the strengths of the materials related to **Depth and Focus on Concepts**?

What could you do to improve the materials?

Source: Targeting Excellence: Aligning Alaskan Environmental Education With Standards **(ANROE 2000)**

IV. Do the materials or activities use scientific inquiry and build life-long problem-solving skills?

(See Part IV: pp. 14-15)

Scientific Processes: Does the investigation incorporate developmentally appropriate scientific processes?	
Questioning: Does the teacher facilitate students to generate age-appropriate, relevant questions?	
Investigating: Are students allowed to design an investigation and provided adequate time to answer their questions?	
Evaluating: Are students encouraged to practice and apply skills for evaluating information?	
Do students identify how values relate to behaviors?	
Communicating: Do students use various media to communicate with a wide range of audiences?	
Environmental Issues and Problem Solving: Do students demonstrate skills in identifying and analyzing problems, then proposing and evaluating solutions?	
Personal Safety and Environmental Impacts: Do students use procedures and equipment to address personal safety concerns and to avoid environmental impacts?	

What are the strengths of the materials related to **Inquiry and Skill Building**?

What could you do to improve the materials?

V. Do materials guide students to actively identify, address and resolve real issues?

(See Part V: pp. 16-17)

Solving Real Community Problems: Do materials encourage students to explore an issue, then develop and implement a plan of action?	
Sense of Power "I Can Make A Difference": Do materials encourage students to take appropriate citizen action to implement their own projects?	
Sense of Place: Is a sense of belonging, ownership, and respect promoted through partnerships with community members?	
Informed Action: Do materials encourage students to base actions on a complete understanding of the issues?	
Responsibility: Do students recognize social, cultural, and ecological consequences of their actions and modify their behavior accordingly?	
Science, Technology and Society:	
Do students explore relationships between science, technology, environment, and society?	
Do students consider ethics and quality of life issues?	

What are the strengths of the materials related to **Action-Oriented Project Applications**?

What could you do to improve the materials?

Source: Targeting Excellence: Aligning Alaskan Environmental Education With Standards (ANROE 2000)

VI. Are the materials fair and accurate?

(See Part VI: pp.18-19)

Balanced Viewpoints: Are differing viewpoints fully explored?	
Factual Accuracy: Are facts referenced to current, well-documented primary sources?	
Separating Facts From Opinion: Are facts and opinions clearly stated in balanced non-inflammatory language?	
Awareness of Values: Do students respect, understand, and empathize with values differing from their own?	

What are the strengths of the materials related to **Fairness and Accuracy**?

What could you do to improve the materials?

ADDITIONAL COMMENTS

Source: Targeting Excellence: Aligning Alaskan Environmental Education With Standards (ANROE 2000)

Correlation Charts

How to Use the Correlation Charts

Standards-based education requires a transition from lessons focused on topics or activities, to those focused on the attainment of important concepts and skills. The Correlation Charts were developed to help educators identify *developmentally appropriate* concepts and skills in the standards that might be related to some common environmental education topics and issues.

The actual correlation will depend on the specific activity, and it is essential that the correlation chart be used only as a **first step**. The next step is to find and understand the concepts and skills that are relevant to a particular topic-or-issue-oriented activity, by reading the pages or sections indicated on the chart on page 27: Where to Find Age-Appropriate Concepts in Standards.

In addition, educators who are very familiar with the standards, but new to environmental education might use the chart to find ideas for teaching to the standards creatively.

Correlation Chart 1: Common Environmental Education Topics

Use these charts to find the science concepts related to the topics you include in environmental education programs. The charts are intended as a starting point to help you find and learn about science standards. The "correlations" and alignment with the standards will depend on the specifics of your program. (An "x" only means that it MIGHT correlate.) For more information about these concepts and how they can be addressed at various age levels, see the standards reference chart on page 27.

Concepts ↓ / Topics Common to Environmental Education Materials and Programs →	Animals (fish, birds, insects, mammals, etc.)	Plants	Endangered Species	Ecosystems	Earth Sciences (rocks, soil, glaciers, geologic hazards,etc.)	Astronomy	Water Quality and Resources, Watersheds	Weather, Climate and Seasons	Energy	Cycles	Traditional Knowledge and Culture	Safety, Winter Survival	Orienteering	Values and Environmental Ethics
Structure of Matter					x	x	x	x	x					
Changes and Interactions of Matter				x	x	x	x	x	x	x				
Universe						x			x					
Earth (tides, weather, seasons)				x	x		x	x	x	x	x	x		
Forces and Motion	x				x	x	x	x	x			x	x	
Processes that Shape the Earth		x		x	x		x	x	x	x	x	x	x	
Energy Transformations				x	x	x	x	x	x	x		x		
Flow of Matter and Energy	x	x	x	x			x		x	x				
Cells	x	x												
Heredity	x	x												x
Diversity	x	x	x	x							x	x		x
Evolution and Natural Selection	x	x	x											
Interdependence	x	x	x	x	x		x				x			x
Local Knowledge	x	x	x	x	x		x	x	x	x	x	x	x	x
Skills of Scientific Inquiry	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Nature and History of Science	x	x	x	x	x	x	x	x	x	x	x	x		x
Application of Science	x	x	x	x	x	x	x	x	x	x	x	x	x	x

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Correlation Chart 2: Environmental Issues

Use these charts to find the science concepts related to *environmental issues* that offer opportunities for problem solving and real-world application of science. The charts are intended as a starting point to help you find and learn about science standards. The "correlations" and alignment with the standards will depend on the specifics of your program. (An "x" only means that it MIGHT correlate.) For more information about these concepts and how they can be addressed at various age levels, see the standards reference chart on page 27.

Concepts ↓ / Examples of Environmental Issues →	Tourism: cruise ship air and water pollution	Land Use: conflicts between snow machiners, skiers, and wildlife	Land Use: Use of forests (e.g., timber harvest and impacts)	Human use of minerals (e.g., hardrock mining and environmental impacts)	Human use of chemicals and contaminant problems	Biotechnology (e.g., genetic engineering)	Water Quality (e.g., human waste disposal)	Ecological effects of global warming related to burning fossil fuels	Predator Management	Transportation: habitat loss and wildlife disturbance issues
Structure of Matter	x			x	x	x	x			
Changes and Interactions of Matter	x	x		x	x	x	x	x		
Earth (tides, weather, seasons)	x	x						x	x	
Forces and Motion		x								x
Processes that Shape the Earth				x			x	x		
Energy Transformations	x			x	x		x	x		
Flow of Matter and Energy	x		x	x	x	x			x	
Cells						x				
Heredity						x				
Diversity			x	x		x		x	x	x
Evolution and Natural Selection						x			x	
Interdependence	x	x	x	x	x		x	x	x	x
Local Knowledge	x	x		x	x		x	x	x	x
Skills of Scientific Inquiry	x	x		x	x	x	x	x	x	x
Nature and History of Science	x	x		x	x	x	x	x	x	x
Application of Science	x	x		x	x	x		x	x	x

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Where to Find Age-Appropriate Concepts in Standards

Structure of Matter	Alaska Science Performance Standards: A1 Benchmarks: pp. 75-80, 268-270 NSES: pp. 127-134 (K-4); 145,154 (5-8); 178-180 (9-12)
Changes and Interactions of Matter	Alaska Science Performance Standards: A2 Benchmarks: pp. 75-80, 249-253 NSES: pp. 127 (K-4); 154 (5-8); 178-180 (9-12)
Universe	Alaska Science Performance Standards: A3 Benchmarks: pp. 62-65, 68, 269 NSES: pp. 127,134 (K-4); 154-160 (5-8); 189-190 (9-12)
Earth (tides, weather, seasons)	Alaska Science Performance Standards: A4 Benchmarks: pp. 68-70 NSES: pp.134 (K-4); 160-161 (5-8); 189 (9-12)
Forces and Motion	Alaska Science Performance Standards: A5, A6 Benchmarks: pp. 87-97 NSES: pp. 123-127 (K-4); 154,155,161 (5-8); 179-181 (9-12)
Processes that Shape the Earth	Alaska Science Performance Standards: A7 Benchmarks: pp. 71-74 NSES: pp. 130-134 (K-4); 158-161(5-8); 187-190 (9-12)
Energy Transformations	Alaska Science Performance Standards: A8 Benchmarks: pp. 76-87, 192-195 NSES: pp. 127,134 (K-4); 154-155 (5-8); 179-181 (9-12)
Flow of Matter and Energy	Alaska Science Performance Standards: A9 Benchmarks: pp. 118-121 NSES: pp. 129 (K-4); 157-158 (5-8); 184,186 (9-12)
Cells	Alaska Science Performance Standards: A10 Benchmarks: pp. 110-114 NSES: pp. 129 (K-4); 155-156 (5-8); 184-187 (9-12)
Heredity	Alaska Science Performance Standards: A11 Benchmarks: pp. 106-109 NSES: pp. 127-130 (K-4); 157 (5-8); 185 (9-12)
Diversity	Alaska Science Performance Standards: A12 Benchmarks: pp. 101-105 NSES: pp. 127-130 (K-4); 155-158 (5-8); 185-186 (9-12)
Evolution and Natural Selection	Alaska Science Performance Standards: A13 Benchmarks: pp. 122-125 NSES: p. 127-130 (K-4); 158 (5-8); 181-185 (9-12)
Interdependence	Alaska Science Performance Standards: A14 Benchmarks: pp. 69, 103-104, 115-117 NSES: pp. 127-130 (K-4); 157-158 (5-8); 186,193-197 (9-12)
Local Knowledge	Alaska Science Performance Standards: A15 NSES: p. 141 (K-4); 170-171 (5-8); 200-204 (9-12)
Skills of Scientific Inquiry	Alaska Science Performance Standards: B Benchmarks: pp. 6-19, 165-173, 285-287, 298-300 NSES: pp. 121-123(K-4); 143-148,168-170 (5-8); 173-176,193-199 (9-12)
Nature and History of Science	Alaska Science Performance Standards: C Benchmarks: pp. 6-20 NSES: pp. 122,123,141 (K-4); 148,160-171 (5-8); 175-176,193-204,300 (9-12)
Application of Science	Alaska Science Performance Standards: D Benchmarks: pp. 10-12, 19, 44-57 NSES: pp.122,129,137-141 (K-4);147-148, 161-169 (5-8);175-176,190-199 (9-12)

APPENDIX 1

GLOSSARY OF KEY TERMS

Assessment Deliberately designed measurement of a learner's achievement or progress. Assessments have explicitly stated purposes which may be embedded in a student's performance task, similar in form to real-life tasks. Effective assessments are appropriately modified to accommodate the needs of special students.

Accuracy Factual information and data are from current primary sources of referenced information.

Action oriented Promotes and encourages use of knowledge and skills as a basis for problem solving and action through individual civic or collective community responsibility.

Adaptable Activity can be easily modified to fit different learning environments, settings, group sizes, and culture settings.

Critical thinking Analysis or thinking process that relies on logical methods and/or deductive reasoning.

Cross-curricular To go, or pass across, from one or more course(s) of study to the next.

Depth Focus on major science, technology, & social concepts in context, and attention to multiple dimensions or aspects of the concepts.

Developmentally appropriate Activity is suitable for learners of a certain age, interest, or cognitive ability.

Developmental levels *Generalized grade designations related to child's* cognitive and psychological development: K-2, early childhood; 3-5, childhood; 6-8, early adolescence; 9-12, adolescence and young adulthood.

Environmental issue Related to, but distinguished from an environmental problem: issues reflect the presence of differing perspectives on possible identification of and solutions to an environmental problem.

Environmental problem Related to, but distinguished from an environmental issue: problem results from an interaction between human-influenced activity and the environment.

Ethics A system of standards for conduct, actions and judgment.

Fact/Factual information A verifiable occurrence, phenomenon, or association of which obtainable information can be consistently corroborated by standard observable or scientific means.

Fairness A balanced presentation of differing viewpoints and theories that is open to further inquiry, and recognizes, respects, and presents various aspects of diversity.

Focus Emphasis placed on the topic of interest or channeled toward a major concept.

Inquiry Scientific inquiry refers to the diverse ways in which scientists study the natural world and propose explanations based on evidence derived from their work. Inquiry also refers to the activities of students in which they develop knowledge and understanding of scientific ideas, as well as an understanding of how scientists study the natural world. Inquiry is a search for knowledge as opposed to problem solving.

Interdisciplinary A knowledge view and curriculum approach that applies methodology and language from more than one discipline to examine a central theme, issue, or experience. Related terms include *multidisciplinary* (juxtaposing several disciplines focused on one problem with no direct attempt to integrate subject areas).

Instructional soundness Recognized instructional methods, techniques, and theories that create an effective learning environment.

Learner centered Activities and instructional methods that are driven by individual needs of the student(s) rather than externally imposed goals or objectives.

Learning styles The belief that individuals favor and are more comfortable with certain methods of learning (e.g., oral vs written, self-taught vs group mediated) and can optimize their understanding when such methods are available to them within the learning environment.

Multiple Intelligences Intelligence depends on the context, the tasks and the demands that life experiences present to us. The eight recognized aspects of intelligence include: Verbal/ Linguistic, Logical/Mathematical, Visual/Spatial, Body/ Kinesthetic, Musical/Rhythmic, Intrapersonal, Interpersonal, and Naturalistic/Spiritual.

Objectives A statement of specific measurable or observable results to be expected from an educational activity.

Primary Source Original, authoritative, or basic material utilized in research: professional reports, manuscripts, or documents that supply a basis for future study, evaluation, writings, etc.

Problem-solving skills Recognizing and defining problem(s), critical listening, collecting and organizing information, generating alternative solutions and developing a plan of action towards solving a problem.

Processes of science Process skills including: observing, comparing, classifying (sorting), sequencing, estimating/ measuring/ordering, communicating, inferring and predicting, collecting and recording, defining operationally, interpreting data, identifying/controlling variables, formulating hypotheses, modeling, experimenting, and theorizing.

Sense of Place A spatial feeling and awareness of belonging to a location or specific surroundings. Significant knowledge of, understanding about, and appreciation for a specific environment, ecosystem, or bio-region.

Society The totality of social relationships among a group of people who are organized by shared institutions and/or culture.

Science Systematized knowledge of how the natural world works and functions. A branch of knowledge derived from observation, a study of facts and by using principles, theories, and established methods.

Technology The application of a complex tool or system, which changes the world; a powerful force in shaping the development and character of civilization. This is different from *Instructional Technology* which is defined as a variety of mechanisms used to store, retrieve, manage, and display information during an educational experience (e.g.,video, film, filmstrip, TV, textbooks, printed resources, equipment, tools, software, CD-ROM, Internet).

Traditional Knowledge That information which has been perceived, discovered, observed or inferred, and passed down through local heritage or cultural lore.

APPENDIX 2
RESOURCES

The standards that were used in compiling this document are found in the following sources:

Alaska State Standards

Content Standards for Alaska Students – Science

- Source:
  Available on the Internet at http://www.educ.state.ak.us/ContentStandards/Science.html, from the Alaska Department of Education, 801 W. Tenth Street, Juneau, Alaska 99801-1894, or call 907-465-2800.
- Summary:
  Recommendations for what all Alaskan students should know and be able to do in science by the time they graduate from high school.

Science Performance Standards for Alaska Students

- Source:
  These will be available on the Internet at http://www.ankn.uaf.edu/. Copies may be obtained from either the Alaska Native Knowledge Network, UAF, Box 756730, Fairbanks, AK 99775-6730, or call 907-474-5086; OR from the Alaska Department of Education, 801 W. Tenth Street, Juneau, Alaska 99801-1894, or call 907-465-2800.
  (Note: As of March 2000, the performance standards were in the process of being printed. Call for availability.)
- Summary:
  A resource developed by a team of educators from around the state to "flesh" out the State science standards, giving examples of expected performances for Alaska students at ages 5-7, 8-10, 11-14, and 15-18. The performance standards were developed to emphasize culturally-relevant science education. Assessment ideas and examples are included.

Alaska Teacher Standards

- Source:
  Available on the Internet at http://www.educ.state.ak.us/Qschools/teacherstandards.pdf, from Alaska Department of Education, 801 W. Tenth Street, Juneau, Alaska 99801-1894, or call 907-465-2800.
- Summary
  Statements of what all teachers in Alaska should know and be able to do to promote quality education in their classrooms.

Alaska Standards for Culturally Responsive Schools

- Source:
  Available on the Internet at http://www.ankn.uaf.edu/standards.html. These standards have also been published in booklet form. To order the booklet, contact fndmd1@uaf.edu, write the Alaska Native Knowledge Network, UAF, PO Box 756730, Fairbanks, AK 99775-6730, or call 907-474-5086.
- Summary:
  Through a series of regional and statewide meetings associated with the Alaska Rural Systemic Initiative, Native educators have developed Alaska Standards for Culturally-Responsive Schools. These standards focus curricular attention on an in-depth study of the surrounding physical and cultural environment in which the school is situated. Additionally, the unique contribution that indigenous people can make as long-term inhabitants who have accumulated extensive specialized knowledge related to their environment is recognized. Standards have been drawn up in five areas, including those for students, educators, curriculum, schools, and communities. The emphasis is on fostering a strong connection between what students experience in school and what they experience in their lives out of school. This is done by providing opportunities for students to engage in experiential, in-depth learning in a real-world context. It is intended that all forms of knowledge, ways of knowing and world views be recognized as equally valid, adaptable and complementary to one another in mutually beneficial ways.

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National Standards

National Science Education Standards:

By the National Research Council, published in 1996 ISBN: 0-309-05326-9

➢ Source:
Available from National Academy Press, 2101 Constitution Ave, NW, Box 285, Washington DC 20055, or call 800-624-6242 or 202-334-3313. Also found in full on the Internet at http://www.nap.edu/readingroom/books/nses/html/
.

➢ Summary:
Developed by a national committee composed of school teachers, university and college faculty, scientists, and state and local school administrators. The National Science Education Standards represents wide agreement about what is important in science education in grades K-12. The Standards provide specific guidelines for: science content, science teaching, professional development, assessment, science education programs, and the science education system.

Benchmarks for Science Literacy:

By the American Association for the Advancement of Science, published in 1993 ISBN: 0-19-508986-3

➢ Source:
Available from the Oxford University Press, Order Dept, 2001 Evans Road, Cary, NC 27513, or call 1-800-451-7556. Also available from the Oxford University Press US Web Site: http://www.oup-usa.org/ or at http://www.project2061.org/tools/benchol/bolframe.html.

➢ Summary:
In 1989, the American Association for the Advancement of Science (AAAS) published Science For All Americans to answer the question of what constitutes adult science literacy and to recommend what all students should know and be able to do in science, mathematics, and technology by the time they graduate from high school. Benchmarks for Science Literacy specifies how students should progress toward science literacy, recommending what they should know and be able to do by the time they reach certain grade levels. Project 2061's benchmarks are statements of what all students should know or be able to do in science, mathematics, and technology by the end of grades 2, 5, 8, and 12.

Environmental Education Materials: Guidelines for Excellence:

By the North American Association for Environmental Education, published in 1996, 24 pages ISBN 1-884008-41-0

Excellence in Environmental Education: Guidelines for Learning:

By the North American Association for Environmental Education, published in 1999, 170 pages ISBN 1-884008-75.5

➢ Source:
Available from the North American Association for Environmental Education's Conference, Publications, & Membership Office, 410 Tarvin Road, Rock Spring, GA 30739, or call 706-764-2926, fax 706-764-2094 or e-mail: beager410@aol.com. An order form is available on the NAAEE website at http://www.naaee.org/.

➢ Summary:
Products from the National Project for Excellence in Environmental Education: EE Materials: Guidelines for Excellence provides recommendations for selecting, evaluating, and producing quality EE curricula, lesson plans, and other instructional materials. Excellence in EE: Guidelines for Learning sets expectations for students' performance in grades 4, 8, and 12, and suggests a framework for comprehensive EE programs with cross-references to national science and social studies standards. Environmental education professionals from a variety of backgrounds and organizational affiliations offered their expertise by participating on the writing team and reviewing draft versions of both documents.

ANROE Resource Guide:

A catalog of environmental education materials specific to Alaska is available from ANROE at: P.O Box 871528, Wasilla, AK 99687-1528 or http:// www.anroe.org/ at a cost of $5.00.

To obtain additional copies of this book, check the Publications page of the ANROE website at http://www.anroe.org or write to:

Alaska Natural Resource and outdoor Education Association
P.O. Box 871528
Wasilla, Alaska
99687-1528

Alaska Natural Resources and Outdoor Education Association
P.O. Box 871528
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